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Making room and moving over: knowledge co-production, Indigenous knowledge sovereignty and the politics of global environmental change decision-making

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The global environmental change research community that engages with Indigenous knowledge holders commonly practice engagement in an extractive way: knowledge is treated as data that can be aggregated and understood in abstract and universal form. This assumes that knowledge and governance are separate and gives knowledge co-production the appearance of playing an informative and facilitative role in global environmental change governance. But seeking Indigenous knowledge to inform environmental decision-making implies that Indigenous peoples are stakeholders as opposed to self-determining nations with rights and responsibilities regarding their knowledge systems and lands. Indigenous sovereignty is not respected when knowledge is treated as mere data for collective decision-making. This paper brings literatures on knowledge co-production together with Indigenous knowledge, research, and environmental governance to explain why co-production scholars must move away from seeking to better 'integrate' Indigenous knowledges into western science and make way for Indigenous research leadership.

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Introduction

According to conventional practice, knowledge co-production is a research practice that seeks to co-produce knowledge with local decision-makers and stakeholders that is useful and usable, or 'actionable' — knowledge that is credible, legitimate and salient to decision-makers [1,2]. Knowledge here is mostly understood as something out there (e.g. a tool, a concept, a model, a framework, a typology, a framing and/or solution to a problem, etc.) that decision-makers should use in planning for the future. From this perspective, knowledge can be articulated, aggregated and circulated through scientific articles, knowledge assessments, books. It can be understood simply by reading or being told about it; it is global rather than tied to a place or a way of life ([3–5]). Consequently, the relationships that compose knowledge co-production are transactional and extractive. The scholarship on knowledge co-production too often upholds this view of knowledge, perpetuating the notion that research is an activity that can be separated from the contexts in which knowledge is acquired and holds meaning and value; that is, from knowledge holders, practices, and the politics that reproduce differential relations of power between groups [6]. This perspective enables knowledge co-production to intervene in global environmental change governance as if its role is solely advisory and facilitative rather than instrumentalist and constitutive of how different societal trajectories and futures are determined [7].

Within this context, there is a push to mobilize Indigenous knowledge to understand and respond to environmental change and sustainability challenges [8–12,13••,14]. However, Indigenous scholarship, land-based practice, and grassroots organizing demonstrate that Indigenous knowledge is not mere 'data' that can be slotted into exogeneous western scientific models. As embodied practice embedded within a worldview, Indigenous knowledge is inseparable from the socio-cultural, political, legal and other grounded, largely place-based relations and obligations that give rise to holistic knowledge *systems* [15,96•,98•,16,17•,18,19]. It is inseparable from the land and from the people [20]. Indigenous knowledge carries what Kyle Whyte terms 'governance value' to Indigenous communities - it has an integral role in the resurgence of Indigenous governance and related legal orders, land-based practices, diplomatic protocols, and other collective capacities that promote the wellbeing of lands and peoples [21••,22]. This is different from the "supplemental value" that is too often afforded Indigenous knowledge — assessed as it is for consistency with western science in the production of 'actionable' knowledge [21••,22,13••,23,24•,25–29]. In the absence of Indigenous governance of Indigenous knowledge gathering and creation, knowledge co-production processes

reproduce the extractive approach to traditional ecological knowledge (TEK) that is well documented in critical policy and scientific scholarship [30–33].

In this paper we begin with a brief account of the holistic nature of Indigenous knowledge systems, prioritizing throughout our paper the voices of Indigenous people. We write beyond the 'integration' of Indigenous knowledges and engagement of Indigenous peoples in knowledge co-production processes pertaining to global environmental change research. We change the terms of engagement, attending to the need for research communities to not only make substantive room for the full expression of Indigenous sovereignty in both a material and discursive sense, but to step aside — that is, to be fundamentally changed via the transfer of resources and authority from the center to Indigenous communities. This is about strengthening and removing barriers to Indigenous self-determination and access to land, which is essential to the nourishment and flourishing of Indigenous knowledge systems [34–36,37•]?

The authors of this piece are informed by different disciplinary backgrounds and relationships to Indigenous ways of knowing. Latulippe acknowledges her teachers in political advocacy and community-based research with Anishinaabek communities. She is motivated by Indigenous philosophies and practices of being in good relationship with the land, in part due to her ancestry from the Kiji Sibi (Ottawa River) area and given her responsibilities as a treaty person. Her research methodology is grounded in relational accountability [32,33,38,39]. Klenk's recent research has been exploring how storytelling is a way of knowing and making decisions, and how stories as forms of local knowledges may reorient the fields of relations (i.e. the meshwork) that compose environmental research and governance arrangements [40,41]. Both authors are academics at an institution located on the traditional territory of the Mississaugas, Huron-Wendat, and Haudenosaunee. Both are challenged to be what Koleszar-Green [42•] terms good guests, responsible for learning and enacting the proper protocols demanded by the land and its stewards.

Indigenous knowledge systems

Indigenous knowledge (IK) or traditional ecological knowledge (TEK) is more than epistemology. Diverse Indigenous peoples share relational cosmologies or worldviews whereby ontology (being), epistemology (knowing), methodology (doing), and axiology (accounting; ethics) are both *interrelated* and operate or exist through *relationships* [38,43]. In the Great Lakes region, Anishinaabe and Haudenosaunee theoretical frameworks explain that *how* one knows is inseparable from *what* one knows; that is, it is inseparable from the world 'out there', the land itself, which is alive, intelligent, and willful, and from the values, moral principles, and laws that govern creation and proper conduct [44,45]. Reo and Whyte [46] write that TEK is the appropriate application of knowledge according to moral values that shape a community's worldview. It is fundamentally inter-connected with practice and belief. While Indigenous peoples adopt new tools and technologies over time in response to changing environmental and other circumstance, Indigenous knowledge remains the embodied expression of traditional moral codes and institutions, such as ethical relationships and responsibilities in relation to other beings in the world [46]. Deborah McGregor [47] explains that TEK is a way of life and proper conduct. Neither static, unchanging, or relegated to the past, Indigenous knowledge is a living system of environmental governance rooted in indigenous cosmologies as they relate to environmental change and challenges over many generations [18,48]. It cannot be uncoupled from the people, the land, or from the ways it is generated, understood, enacted, or shared.

As embodied, relational, and place-based systems, innovations in Indigenous knowledge are not restricted to the academic literature but take place on the land. Notable examples include the Mother Earth Water Walk, Little River Band of Ottawa Indians Lake Sturgeon (Nmé) restoration program, Alderville Black Oak Savannah, Antler River Guardians, and Indigenous Food Garden (See Refs. [49,50,51•,52–54]). These are just a few examples of Indigenous-led, land-based initiatives from the Great Lakes region, where the authors are situated. The scope of these projects exceeds what is conventionally considered 'environment' and 'research' to include protocols and ceremony, building and renewing relationships between people and with other (more-than-human) beings of creation, inter-generational transmission of knowledge, land-based learning, art and design, public education, fostering of mutual responsibility, resource harvesting, law, treaty implementation, and so on.

Examples of Indigenous knowledge in practice also include mass resistance movements to protect the land. Recent actions include Idle No More, the Oceti Sakowin Camp at Standing Rock, and Unist'ot'en Camp. Indigenous women leaders are clear that the healing and defense of lands and bodies are intimately interconnected, challenging western binaries in the process, i.e. society-nature and mind-body [55,94••,56•,57]. Within the academy, Indigenous science and research projects are designing and implementing Indigenous ethical protocols and partnering with communities to pursue their research priorities and objectives [58•,97•,59]. Key texts are not confined to the most recent publications but are fully expressed on the land by Indigenous individuals, institutions, communities, and nations.

While outside interest may be new, Indigenous knowledge and research are not. Much has already been published about Indigenous knowledge, culturally relevant research paradigms and principles of ethical conduct, including how these relate to non-Indigenous ways of

knowing and being [19,38,39,47,60,61,62••]. To facilitate respectful and mutual beneficial research relationships, many Indigenous communities are codifying research protocols and formalizing structures of accountability [63,64••]. Principles such as OCAP - ownership, control, access and possession, have been established to protect Indigenous intellectual property, creating a framework for Indigenous control of data collection, ownership, protection, and use [65]. The United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) establishes Indigenous self-determination and free, prior, and informed consent (FPIC) as international human rights standards, which pertains to research and environmental planning. In situations that necessitate cooperation with neighbouring non-Indigenous jurisdictions, Indigenous communities are leading the development and implementation of environmental governance models that embody the nation-to-nation relationship, coexistence principle, and 'empowered' co-management [66–69]. In climate change research, environmental planning, and other environmental stewardship and sustainability initiatives, practitioners and scholars are documenting evidence-based practices for working more effectively with Indigenous peoples [70•,95•].

Indigenous research and knowledge exchange are not new, and there is no shortage of Indigenous voices to guide appropriate engagement with Indigenous peoples in a research context; However, Rauna Kuokkanan [71] poses the key question: Can research and higher-education institutions really *hear*? Research is not separate from the constitutively racist and colonial logics, policies, and laws of white settler-colonial society [72,73,74]. In the environmental sphere, Indigenous knowledge continues to be treated as material to fill gaps in existing theories, data sets, methodologies and outputs, resulting in its theft, misappropriation, and commodification [30,75,76,21••,22]. Evidently, dominant institutions are not prepared to *receive* the gift of Indigenous epistemes [71]. Pushing back, a collective of Indigenous scholars recently wrote that universities are no more 'entitled' to Indigenous knowledge than settler-colonial states are to Indigenous lands [77]. Dominant research institutions and actors, including co-production scholars, need to critically reflect and fundamentally restructure normative practices.

Making room and moving over

To make room is to value Indigenous ways of knowing, being, and doing on their own terms and to create culturally-relevant, appropriate spaces for Indigenous scientific research to flourish within existing knowledge production infrastructure. In the current social and political climate in Canada where the authors are situated and most familiar, this work is sometimes referred to as 'decolonizing' or 'indigenizing' the university, and it is often situated within discourses of truth and reconciliation [93•,78,79]. To make room within dominant environmental research and policy arenas requires a willingness to know and do things differently.

Making room is multi-faceted. Creating institutional space that responds to the needs and priorities of Indigenous researchers, students and communities includes expanding the adjudication criteria, timelines, and resources associated with research grants to accommodate the governance structures of Indigenous community partners; building robust review processes for ethical research with indigenous people; increasing student, staff and faculty recruitment and retention at universities; and broadening authorship, tenure and promotion criteria.[1] It includes facilitating knowledge exchange between Indigenous researchers and practitioners, sponsoring mentorship, training and capacity building, and ensuring that Indigenous people and initiatives are genuinely present and feel safe at multiple levels of the institution, including senior administration and governance [80,64••]. As opposed to extracting knowledge, making room is about collaboration and partnership [81•,64••], and fostering understanding, equity, and empowerment [18] at every stage of knowledge production.

Making room should be transformative. In Canada, Senator Murray Sinclair, Chair of the Truth and Reconciliation Commission (TRC), made it clear that reconciliation is a 'Canadian problem' not an 'Indian problem' (64••, 820). Non-Indigenous people need to understand themselves in relation to the ongoing legacy of Indigenous dispossession and genocide — that violence to Indigenous minds, spirits, bodies, and lands is fundamentally part of their story, their privilege, and is their responsibility to address [64••]. To be transformative, making room is about decolonizing research; that is, to 'unpack the impact of colonization on a very fundamental level – basic humanity' ([64••, 818]; [72]). To make room is to change what is known about Indigenous peoples and the way research is conducted. It is to expand and fundamentally transform ways of knowing and being in the world — including western research itself, through meaningful contact with Indigenous knowledge paradigms. It is to learn to '"[approach] the world with humility, respect for the diversity of knowledges of humans and non-humans, and a responsibility to honor other beings, entities and collectives as animate' ([82•, 7–8]; [21••,22,58•]).

Having said all this, to make room has its limits. Decolonization is not a metaphor; it is material, necessitating the return or re-matriation of Indigenous lands and cultural values through which the settler-colonial system derives unfettered wealth [83]. Without the substantive transfer of lands, resources, and decision-making authority over

[1] This was reflected, for example, in the National Dialogue for Strengthening Indigenous Research Capacity convened by one of the major federal funding agencies in Canada, the Social Science and Humanities Research Council [80].

traditional and treaty territories to Indigenous peoples, making room within dominant research institutions cannot address the extraction, mis-representation, and exploitation of inter-linked Indigenous knowledge systems and lands.

Going over and above institutional support for Indigenous knowledge, to move over is to make way for Indigenous research leadership on Indigenous lands. It is to de-center western science and institutions as primary sites of knowledge production and leadership — to give up power and privilege [64••,80]. Moving over is about empowering Indigenous research — that which is based on Indigenous worldviews, knowledge, perspectives, needs and questions [64••], and Indigenous science — 'systems of knowledge for observing, collecting, categorizing, recording, using, disseminating and revising information and concepts that explain how the world works' and using it 'to ensure the flourishing of [Indigenous] communities' health, livelihood, vibrancy and self-determination' ([82•, 1]). Indigenous scientific research should not be contingent on external recognition, concepts, or partnerships, nor should it be reliant on resources intended for and in competition with universities. Moving over is about the wholesale transfer of research resources and authority to Indigenous-led knowledge gathering, generation, and mobilization.

To move over is to remove barriers that impede the practice of Indigenous knowledge; that is, Indigenous people need access to lands and resources. Persistent structural barriers are both material and discursive, including the illegal occupation of Indigenous lands and suppression of Indigenous authority to exercise jurisdiction over those lands [56•,84,85]; ongoing genocide [99], major social, health, and economic gaps [86]; disproportionately high exposure to environmental risks and harms [22,87]; and the extra burden faced by Indigenous scholars, students, staff, and knowledge holders to unsettle dominant institutions [64••], to name a few.

Making room and moving over resonates with Indigenous knowledge sovereignty, a powerful two-pronged conceptual framework. It includes, i) practices that strengthen Indigenous knowledge systems and their transmission according to Indigenous governance structures, and ii) the removal of external barriers (policy, jurisdictional, legal, etc) to their expression on the land [88•,21••,22]. Knowledge sovereignty is not a new concept. In Canada, the Crown has an obligation to uphold the original terms of settlement and subsequent law, the historic treaties [89–91]. Internationally, across all Indigenous territories, Indigenous peoples are entitled to their lands and resources, to self-determination, FPIC, and to practice their intellectual traditions, governance processes, and legal orders (i.e. responsibilities) [92]. Nor is knowledge sovereignty contingent on external recognition of Indigenous ways of knowing, the benevolent allocation of short-term program dollars, or fostering equality among diverse publics. It is an entitlement rooted in Indigenous sovereignty, title, and rights.

Concluding thoughts

While knowledge is more than a transaction involving data extraction and number crunching, Indigenous knowledge does not operate in isolation. Many Indigenous knowledge holders weave methods from western sciences into their own knowledge systems [82•]. Kimmerer [20] describes this relationship in terms of the Three Sisters horticultural model whereby Indigenous values, ethics and protocols are the scaffolding (corn) that guides the application of powerful western science tools of inquiry (beans), supported by an environment that is conducive to mutual respect and reciprocity (squash). Not everything is *for* non-Indigenous people from a knowledge sovereignty perspective, but non-Indigenous researchers and institutions have a role in creating a meaningfully supportive environment; for instance, by working to acknowledge and redress past harms, uproot ongoing institutional racism and colonialism, enact treaty and guest responsibilities to Indigenous lands and peoples, give effect to the UNDRIP, and, in Canada, deliver on TRC recommendations [64••,42•]. There is no single route to the right relationship. Gaudry and Lorenz [93•] propose a tiered progression of decolonizing knowledge production until a 'dual' university system defined by Indigenous resurgence and fundamental institutional change is achieved and reciprocal nation-to-nation relations become possible. Kyle Whyte [48] focuses on the relational and processual: ' . . . care must be taken to show that [TEK] invites participation to a long term process of mutually respectful learning. And more effort needs to be taken to understand what these processes should look like' (10).

Indigenous knowledge is inextricably linked to Indigenous self-determination, rights and responsibilities, which includes respect for the obligations of all beings of creation, not only human. Indigenous governance ought to be central to any conversation on knowledge co-production and societal transformation to support sustainability goals. As Indigenous scholars, land stewardship activities, and legal frameworks demonstrate, Indigenous people will continue to advance Indigenous research. That will not change. But with substantive investment in relationships (to make room) and transfer of decision-making authority and resources to Indigenous-led projects and collectives (to move over), it may become possible to build relationships capable of sustaining shared, intersectional action in response to global environmental change [82•].

Conflict of interest statement

Nothing declared.

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This two-part report situates Karuk traditional knowledge in the practice of cultural management, indicating how Karuk knowledge must remain connected to both the practices that generate and emerge from it. It draws from the experiences of the Karuk Tribe and a review of Tribal case studies in the American context, academic and legal literature and current policy initiatives to outline current cultural and institutional barriers for the sovereignty of traditional ecological knowledge and provide a range of recommendations for their resolution at federal, statewide and regional levels.

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'Indigenization'is not universally conceived. Research conducted in Canada in the university context shows that it may range from inclusion and recognition initiatives, to reconciling existing institutions and frameworks to those of Indigenous peoples, to decolonizing or fundamentally altering the status quo towards a dual or co-existing university system.

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This resource draws powerful links between environmental harm and settler-colonialism; namely, state and environmental violence against Indigenous lands and Indigenous bodies, especially women. Research should meaningfully support Indigenous responses which include cultural

and community-based healing, legal tools, land/body defense, and 'transformative resurgence' (52), including peer-led initiatives. Research should also work to and eradicate the root causes, the barriers to Indigenous sovereignty and self-determination.

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The publication is an informational resource for tribes, agencies, and organizations across the United States interested in understanding traditional knowledges (TK) in the context of climate change. It focuses on two principles, 'Cause No Harm' and 'Free, Prior and Informed Consent', and eight guideline: i) Understand key concepts and definitions related to TK; ii) Recognize that indigenous peoples and holders of TK have a right not to participate in federal interactions around TK; iii) Understand and communicate the risks for indigenous peoples and holders of TK; iv) Establish an institutional interface between indigenous peoples, TK holders, and government for clear, transparent and culturally appropriate terms-of-reference, particularly through the development of formal research agreements; v) Provide training for federal agency staff working with indigenous peoples on initiatives involving TK; vi) Provide direction to all agency staff, researchers and non-indigenous entities; vii) Recognize the role of multiple knowledge systems; and viii) Develop guidelines for review of grant proposals that recognize the value of TK, while ensuring protections for TK, indigenous peoples, and holders of TK.

96. Hitomi MK, Loring PA: **Hidden participants and unheard voices?**
• **A systematic review of gender, age, and other influences on local and traditional knowledge research in the North**. *FACETS* 2018, **3**:830-848

In this review the authors describe a gender and age bias in research on Indigenous knowledges in the circumpolar North. They also identify networks of researchers led by one or a few male authors. The authors challenge assumptions about Indigenous knowledge holders and practitioners and raise awareness about the role that scholarly networks play in reproducing the marginalization and dispossession of colonialism.

97. *Indigenous Environmental Justice Project (IEJ)*. 2019 https://
• iejproject.info.yorku.ca/

This research project aims to develop a distinctive environmental justice framework that is informed by Indigenous knowledge systems, laws, concepts of justice and the lived experiences of Indigenous peoples. It is resource for community members, students, activists and scholars in their fight against environmental injustice; provides resources for educators; and creates opportunities for inclusive dialogue on how to move toward greater justice.

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• **understanding of weather and climate change in Amazonia**. *Ethnos* 2018, **83**:607-623

In this case study the authors analyze climate and weather-related discourses and practices of Indigenous Matsigenka people and migrants from the Andean highlands to the tropical lowlands in Amazonia. The authors describe the entanglement of modern science with Indigenous knowledge systems and how the Andean migrants employ climate change discourse to legitimize their superiority over the Matsigenka people. The authors argue that scientific climate discourse serves as a means to transform Matsigenka people in modern citizens and disempower local knowledge systems and Indigenous people's sovereignty over their lands.

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